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THE FARMER AND HIS GOVERNMENT

The relations between the farmer and his government should be the chief interest of the statesmen in an agricultural country. This hypothesis must predicate any consideration of agrarian policies. And it becomes an axiom for all who believe that the mere preservation of peace and security of property do not constitute a sufficient apology for a political entity.

In the Philippines, where almost every peso comes from the soil, where industries exist solely to prepare the products of the soil for market, and where commerce carries only the fruitage of the fields, the concern of the statesman for the farmer should be paramount. In a consideration of the relations existing between the Philippine agriculturist and the Philippine government, one can not but see a complex situation demanding analysis and interpretation.

A short time ago, urged by the initiative of administration leaders, and with governmental approval, an Agricultural Congress was organized. The Government by its attention to and fondling of this organization morally obliged itself to, at least, lend an attentive ear to its deliberations. Without going into details it may be well to point out that this congress called the administration to task on things agricultural and demanded an accounting of its past as well as a prospectus of its future agrarian policies. Although some of the resolutions of the congress of an urgent nature were adopted as laws, it is greatly to be regretted that others, apparently of equal importance, were not acted upon favorably by the Government. And it was claimed by certain ardent supporters of the congress that the Government considered that the child of its creation had become the critic of

its parent. It seemed as though official interest in the congress waned, and as though mutual distrust arose. Then the congress closed, supposedly to meet again in 1919, a year later.

Weeks previous to the time for its reconvention, the congress, announcing that it would not meet, claimed, or at least gave the public reason to believe, that it must default because the administration had not heeded its former resolutions. This was a rather weak attitude on the part of the congress. Even though the Government did not act favorably on all the resolutions, a greater amount of good would have resulted, had the congress taken a stronger stand, by reconvening and insisting on its resolutions. Early in 1919 we find the farmers and the Government apparently apart in the eyes of the public, and this in spite of the fact that not a few of the leaders in the Agricultural Congress were also members of the Legislature and possessed of both prestige and power in the control of the administration. The misunderstanding between the administration and the Agricultural Congress showed one wholesome thing, that the congress was not politically made nor was it to be politically controlled.

In 1919 this same body of men who met in the Agricultural Congress and scored the administration—men who, it has been claimed, will eventually represent and control the rural electorate of this agricultural country—returned the administration to power with an immense majority. This approval of the Government, direct and overwhelming as it was, could not have crystallized upon any extraneous issue, for none existed and none of general force had been created. The return of the Government meant only that the electorate had approved of its stewardship and did not intend to make the Agricultural Congress a political matter. Whether consciously or unconsciously, this was a most sagacious intention, for one cannot but realize that the rural interests stand a better chance of extending power in the existing government into virtual control, than they do of replacing it, even in the remote future, with a new administration.

Shortly after its reapproval by the electorate, a recurrence of the rice problem —a problem, locally chronic, made active by a suddenly increased and unfavorable differential between supply and demand throughout the Orient—excited the entire régime into activity. The shortage was a bonanza for the rice producer, but a catastrophe for non-rice-producing rural regions as well as for the comparatively insignificant unlanded urban population. The problem was a political dilemma, and somebody must be hurt. After a minimum of delay, stirred by the increasing seriousness of the matter, and encouraged by its recently demonstrated strength, the Government solved the problem and averted some degree of suffering by a fairly extensive seizure of speculatory stocks, distribution, and fixed consumers' prices. The methods were subjected to surprisingly little criticism when one considers that the economy of the solution could only be apologized for on the grounds of emergency.

The rice situation being tided over, the statesmen and leaders found themselves in an agricultural frame of mind. Either they were stimulated by the crisis of the year or by the augmenting power of the agricultural leaders in the administration itself. There was, aside from these possible influences, an additional stimulation from without. The world's dependence upon food distribution became manifest in the year succeeding the armistice. Throughout the world, problems of profiteering and food distribution became even more

the topic of the day than food production. The broad appeal of nationalism, so commonly engendered by great wars, swept from pole to pole and encircled the globe with its fervor. And with it, pride in economic independence was spontaneously manifest, here, as elsewhere.

With the opening of the Legislature in 1919 the agricultural renaissance of the Islands was definitely inaugurated. Previous to the sitting of this body, spirited comment of every description and prognostication of various degrees of value were to be heard from every source. Scarcely two months after the Legislature has opened one may find half a hundred bills presented that deal directly with agricultural problems, and half a hundred more that have a less emphatic but, nevertheless, important bearing upon rural interests. Every phase is represented by a bill and where there is an opposing side, where there is a corner of vantage, others are docketed. The whole is an array of proposed enactments in many of which may be discerned opinions similar to those resolved by the Agricultural Congress. Among them all—good, bad, and neutral—must somewhere lie the path of proper selection. But the intellectual ingenuity of the members of any legislature would be taxed in the winnowing process.

There are, as might be expected, not a few proposals for improving distribution and production of the most essential cereal—rice. Too many look to the idea of controlling demand and supply—an economic force that legislation has long tried and seldom succeeded in counteracting. Others look towards subsidy of production—a possible method, though in the end uneconomic, because in general the same persons who receive the subsidy must pay the heavy cost—in short, as if lacking the astuteness to produce a sufficient quantity of a desirable commodity, a group bound themselves together to pay each other for doing so. It is more than possible that rice production has been sufficiently encouraged by the shortage and its entailed suffering. Legislation furnishing funds for the hiring of experts to select and breed certain high-producing, low-cost varieties of rice would be of the most immediate value to the palay producers, none of whom are in a position to accomplish this formidable program alone or under less than national organization.

In a consideration of land laws and land policies, it should be borne in mind that in so far as these look towards anything except the immediate development by freeholders of the present vast area of fertile and unoccupied government lands, their benefit to the farmer is small. What is most to be desired as the result of any agrarian program, is not necessarily a larger product per hectare, nor merely a larger total production of commodities, but a greater product per capita. Intensive farming, heavy, labor-demanding intercropping for yield, and the substitution of heavy crops, do not necessarily bring this result—they may merely economize land, of which the country has quantities uncultivated, and they may bring about a waste of labor. The general problem of intensive cultivation *versus* extensive cultivation must of course be given thorough investigation before an adequate knowledge of the most advantageous balance may be had. But at present it appears that any land law to improve the entire fabric of rural conditions must promote homesteading and leasing of land certified as suitable for agricultural purposes. The essential cause of hesitancy in going out on new land seems to be the disinclination to break up the barrio system—a social order of great advantage and of ancient prestige throughout the Islands.

Legislation having in mind settlement of new lands under some colony adaptation has been presented. Without regard to the specific terms of any individual proposal, it may safely be said that this is the proper policy from the socio-economic standpoint. But readjustment should not be permitted to block the development of large-scale export-crop production, which is of advantage whenever it does not interfere with other classes of production and so long as it is vigilantly controlled.

It was reported that the President, prior to leaving for Versailles, requested information as to the status of water-power and irrigation in the Islands. This was one of the few times that extraordinary information regarding Insular affairs has been requested by the Chief Magistrate, and not much favorable data could be furnished. This department of valuable public policy has been given much less attention than it would appear to deserve. It has been claimed, perhaps justly, that much of the farmer's uneconomical use of labor results from his inability, because of lack of irrigation, to raise two crops of rice in a year. This is a problem that requires further investigation, since it has not yet been determined under what conditions the growing of two successive crops of rice in a year, on the same area of land, is advantageous. Rather than now advocating this method, it should first be subjected to adequate investigation. Under conditions that make irrigation desirable, water conservation should be a community matter, and the larger the community uniting in its control the more efficient will it be.

Many districts of agricultural production in the Islands have fastened upon them a system of labor employment that amounts almost to servitude through money and commodity advances, though it is of course true that these advances are solicited by the laborers themselves. Contract jumping results directly from usurious and loosely held customs of this sort. It is more than likely that the landlord class will be the first to approve of the prohibition of this afflicting incubus. It is at least certain that it will be to their final advantage. Along this same line lies the matter of the rural credit system. The Rural Credit Division of the Bureau of Agriculture has extended an admirable system to the furthest confines of its jurisdiction. There now exists an unsubsidized, fully manned, and successful chain of associations, the result of tireless work and a surprising degree of co-operation. This system is distinctly a going concern. It comes up now with a good record and asks no quarter or subsidy. Should an extension of its activity demand further agencies in the form of central credit banks, the legislators should not hesitate to give it whatever it requires.

Another issue at hand, and one that will continue always to demand the attention of those who hold the purse strings of the country, is the necessity for the highest type of agricultural education. Success presupposes knowledge. Successful agricultural production rests upon knowledge of the sciences underlying agriculture and of the practical applications of these sciences to the art of agriculture. Institutions devoted to this end, institutions given over to the education of scientists and husbandmen who can understand, diagnose, and provide for the problems that will continually arise, are quite as vital to the farmer as is water when soil is dry, money when the pay-roll is to be met, or rice when the granary is low. Ten words of an expert are frequently equivalent in value to a decade of experience. Civilization is little else than intellectual capital coined from astute minds. Money expended for the purpose of agricultural research, for the training of leaders, and for providing the nucleus of a future

commercial and scientific farmer class, is money invested in the economic security of the community. Have we not sometimes forgotten that practical really means economical? Must we not realize that real economy is the sacrifice of the little now for provision against the future? Are we not to believe that it is quite as feasible to store up brains as it is to lay by gold? In following out a program of rural advancement agricultural education demands more than a left over modicum of consideration. Because this end of the program produces no immediate income, the mental spendthrift refuses to receive it. Because it produces manifold returns in the future, whoever has the best interests of the community at heart will accord it a more than moral approval.

In a word, the farmer in the Philippines may expect of his government, legislation and support, a careful selection of measures suited to supply him modes of access to land, money, and capital at legitimate rates, support for the learning of his craft, the advice of the best experts, and laws counteracting any tendencies toward soil peonage. And the government may expect of the farmer tax collections to meet the many expenses involved. The relations center upon reciprocal obligations—obligations which neither party may shirk with impunity.

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DISEASES OF ECONOMIC PLANTS IN SOUTHERN CHINA [1]

By Otto A. Reinking

Of the Department of Plant Pathology

THREE PLATES

During the months of May and June, 1919, the writer made a disease survey of the agricultural regions of the delta of Kwang Tung Province around Canton, Macao, and Hongkong, and also in southern Kwang Si Province, along the West river. The trip was made possible through the co-operation of the division of Crop Physiology and Breeding Investigations of the Bureau of Plant Industry, Washington, D.C., with the University of the Philippines. While the list of diseases given in the present paper undoubtedly includes only a part of those on economic plants in southern China, since it comprises those collected on this one trip, nevertheless it should give an idea of the prevalence and destructiveness of plant diseases in this region and should suggest control measures.

The primary object of the survey was to investigate the diseases of citrus with the aim of obtaining first-hand knowledge of all fungi present upon these plants. Since a large number of citrus varieties is to be introduced from China into the Philippine Islands and the United States, through the interest of Mr. W. T. Swingle of the U. S. Department of Agriculture, it is of the utmost importance to know what diseases attack citrus species in China, in order that proper precautions may be taken in such introductions. As a similar problem presents itself in connection with introductions of other crops, the writer did not confine his attention entirely to citrus, but collected diseases of all economic plants growing at that time of the year. The excessive humidity of May and June constitutes a condition extremely favorable to the development of fungi and for that reason facilitates a representative collection from all the crops of the season.

The entire time was spent in making the collection, little attempt being made to identify many of the fungi while in China. The causal organisms were determined by the author in his laboratory at the College of Agriculture, Los Baños, Laguna, P. I. The writer is indebted to Mr. E. D. Merrill of the Philippine Bureau of Science for a number of host identifications.

In general the diseases in southern China are very much like those in the Philippines. [2] There are, however, some serious maladies in China that should be kept out of the Philippines. Among these diseases are scab of citrus, red spot of sorghum, and *Sclerospora* of millet. It is difficult to account for the absence of citrus scab in the Philippines; but thus far it has not been observed. One paper reported scab [3] as occurring in these Islands; but the author of that article later stated that he had mistaken citrus canker for scab. Since little was known of canker at that time, it was rather easy to confuse the two.

The list of diseases here presented includes by no means the entire collection made on the trip. Besides those given, one thousand other numbers have been

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[1] Experiment Station contribution, No. 22.

[2] Reinking, Otto A., Philippine economic-plant diseases. Philippine Jour. Sci., Sec. A, **13**: 165-274. *Pl. 1-22 fig. 1-43.* 1918. *Idem*, Host index of diseases of economic plants in the Philippines. Philippine Agriculturist **8**: 38-54. 1919.

[3] Wester, P. J. Citriculture in the Philippines. Bureau of Agriculture Bulletin 27:56. 1913.

recorded, some on economic hosts, others on wild plants; these have been sent to experts in Europe and in the United States for identification. The writer gave his attention primarily to fungi occurring on economic plants. The pages which follow contain brief descriptions of the diseases, together with designations of the causal organisms and suggestions regarding control measures. The host plants are arranged alphabetically according to their common names.

DISEASES OF ECONOMIC PLANTS

ALFALFA. *Medicago sativa* Linn.

Downy Mildew. *Peronospora trifoliorum* de Bary—Great damage was produced in experimental plots of alfalfa. Affected leaves turn yellow or gray and drop from the plant. The lower surfaces of such leaves are covered with a white or purplish downy growth. The crop should be planted in an airy, well-drained location.

Leaf Spot. *Cercospora medicaginis* Ell. et Ev.—Many brown or black spots almost circular in shape, bordered with yellow, are found in large numbers on leaves. In severe infection, a yellowing and defoliation takes place.

AMARGOSO. APALIA. FU KUA. *Momordica charantia* Linn.

Downy Mildew. *Pseudoperonospora cubensis* (B. et C.) Rost.— Distinct angular yellow spots may be present in abundance on the leaves. When older, the infections have pale white centers bordered with a yellowing of the green healthy leaf. Severe losses may result from the attack. The fungus causing the disease is found commonly on all cucurbits and related plants. Spraying with Bordeaux mixture has been found beneficial.

Fruit Rot.—Undetermined.—Rot of fruits is frequently encountered. No causal organism could be assigned. A *Lasiodiplodia* may be present on old rotted fruits.

ARROWHEAD. SAGITTARIA. *Sagittaria sagittifolia* Linn.

Leaf Blight. *Cercospora.*—Blackish spots or blotches are, in many cases, present, on the leaves. Usually little injury is produced.

Stem Rot. Undetermined.—At times, rotting of the stems occurs. The symptoms appeared as if the disease is produced by some phycomycete.

ASPARAGUS. *Asparagus officinalis* Linn.

Black Speck. Undetermined.—A common superficial fungus, found on corn and beans, also attacks asparagus. Black specks of the fungus bodies are scattered over the stem. The organism unquestionably penetrates, because a slight yellowing of the host tissue is present around the black bodies. Plants are not materially injured.

BAMBOO. *Bambusa spinosa* Roxb. (*Bambusa blumeana* Schultes.)

Rust. *Puccinia longicornis* Pat. et Hor.—Leaves of the bamboo are, as a common thing, severely attacked by rust. Brown sori occur in the greatest numbers on the lower surface of the leaf. Badly diseased leaves have yellow areas on the upper surface, and often drop from the plant.

Schizophyllum commune Fr. grows on dead culms. A large number of other saprophytic fungi, which weaken structural bamboos, are present on dead stems.

BEANS. *Phaseolus vulgaris* Linn.

Bacterial Blight. *Pseudomonas phaseoli* Erw. Smith.—Bush and climbing beans of the *Phaseolus vulgaris* Linn. group are severely attacked by bacteria causing a blight. Irregular, brownish spots with watersoaked edges appear on the

leaves. The infection may spread and cover the entire leaf and cause its death During dry weather the affected parts become papery and brittle. On the pods a brownish watery spot is formed, and the bacteria spread through the pod into the seeds. The attack gives rise to severe losses in many plantings. Since infected seed is the chief means of spread, seed for planting should be selected only from healthy plants. When severe cases of infection occur, crop rotation should be practiced.

Leaf Speck. Undetermined.—The same fungus growing superficially on corn and asparagus may develop on the leaves and stem of beans. The organism has the form of raised black specks. Little or no damage is done.

Frequently, a black mold is present on dead stems and pods. *Alternaria* spores occur in the mass of dark colored mycelium. *Trametes persoonii* Mont. grows on dead leaves.

Leaf Spot. *Cercospora.*—A *Cercospora* spot, similar to that produced by *Cercospora lussoniensis* Sacc. in the Philippines, is commonly found on the climbing as well as the bush varieties of beans. When small, the spots are reddish brown; when larger, they have ashen gray centers bordered with reddish brown rings. Greater portions of the leaf surface may be affected, because of fusion of diseased areas. A *Cercospora* was observed also on the dead stems. It is advisable to practice crop rotation.

BEET, RED. *Beta vulgaris* Linn.

Leaf Spot. *Cercospora beticola* Sacc.—A severe leaf spotting is usually present on the common garden red beet. When young the affected portions are small brownish or black specks. Older spots are circular with gray centers bordered with purple running into brown. Concentric rings of brown are, as a common thing, present within the disease parts. Infections may run together and cover almost the entire leaf surface. In market gardens spraying with Bordeaux mixture can be economically done.

Root Rot. *Sclerotium.*—An extremely serious soft storage rot may be common. White strands of mycelia, among which are found brown sclerotial bodies, grow over the diseased parts. Injuries should be avoided during harvest. The roots ought to be stored in properly constructed rooms provided with sufficient air movement.

BILIMBING. *Averrhoa carambola* Linn.

Leaf Spot. Undetermined.—Many times leaves are severely spotted. The infections have gray centers bordered with a pink or reddish ring.

CABBAGE. *Brassica oleracea* Linn.

Leaf Spot. *Alternaria brassicae* (Berk.) Sacc.—The affected portions are usually nearly circular, with black centers, marked with concentric rings. An indefinite border, grading into the healthy tissue surrounds the black portion. The infections often attain a size of from one to three centimeters. The center of the older diseased parts becomes brittle, and falls out, leaving an irregularly shaped hole. In severe cases the injury may be great, and even result in the death of the plant.

CARNATION. *Dianthus caryophyllus* Linn.

LEAF BLIGHT. Undetermined. —Leaves of carnation often turn brown and die. Spores of *Alternaria* and *Fusarium* are present on the dead leaves.

CARROT. *Daucus carota* Linn.

ROOT ROT. *Sclerotium.*—Carrots, after being dug and placed in storage, are attacked by a common *Sclerotium* soil fungus. Affected roots have a white mass of mycelium radiating from centers and spreading over the rotted parts. The fungus strands give rise to spherical brown sclerotial bodies. To prevent losses in storage, care should be taken to prevent injuries during harvesting, and the roots should be stored in a well-ventilated place.

CASSAVA. *Manihot utilissima* Pohl.

LEAF SPOT. *Cercospora manihotis* P. Henn.—Irregularly circular brown spots may be present in large numbers. Plants are only slightly injured. Crop rotation will control the disease.

On dead or nearly dead stems may develop a *Nectria* and *Schizophyllum commune* Fr.

CASTOR OIL PLANT. *Ricinus communis* Linn.

LEAT SPOT. *Cercosporina ricinella* (Sacc. et Berl.) Speg.—The leaves of the castor oil plant usually are more or less severely affected. The infection when young is merely a brown speck, but when older has a gray center surrounded by a brown or purplish ring. Only slight losses occur from this disease.

CELERY. *Apium graveolens* Linn.

EARLY BLIGHT. *Cercospora apii* Fr.—The leaf surfaces of celery are covered commonly with irregular roundish spots that often fuse, forming blotches. Young specks are light brown, while older diseased parts have ashen gray centers bordered with a brown ring. Serious damage is done in certain plantings. Crop rotation will aid in controlling the disease.

CITRUS SPECIES [4].

LEMON. SOUR RED LEMON. NING MUNG. *Citrus limonia* Osbeck.

BLACK SPOTS. Undetermined.—Black shiny spots are present on the leaves and stems. The disease is common and is serious. It is apparently either of a bacterial nature or is caused by some abnormal physiological conditions.

CANKER. *Pseudomonas citri* Hasse.—The "Ning Mung," or sour red lemon, is severely cankered on stem, leaf, and fruit. Brown raised cankered areas are formed on the affected parts. The infections extend through the leaves. Much damage may be done.

LICHENS. Undetermined.—Various kinds of lichens may be found growing over all woody parts, and even on leaves of the plants. The attack is especially severe on trees grown in areas subject to floods. Often the trees are entirely covered with large mossy structures. Severe damage is done in many cases. Al-

[4] All citrus varieties are arranged alphabetically according to their common names.

though the lichen is superficial, it does affect the normal activities of the trees to an extent which lowers their vitality and, consequently, their fruiting power. A wash composed of a six per cent solution of copper sulphate can be used to control the growth on the trunk and older branches.

Scab. *Cladosporium citri* Massee.—The leaves may be seriously affected. Brown raised portions are present in greatest numbers on the lower surface. The scab does not extend through the leaf, but on the upper surface there is a slight depression opposite the infected area. The disease is confused frequently with citrus canker. Spraying with Bordeaux mixture is effective as a control.

Septobasidium albidum Pat.—The stems and leaves of the sour red lemon are often covered with a thick, soft, leathery brown growth (Plate I, fig. 5). Since the fungus is parasitic on scale insects, it grows vigorously on branches severely infected with scale. Entire twigs and branches are killed. Whether the fungus plays a very important part in this destruction is questionable, since the attack by scale insects is usually sufficient to cause a serious setback. As the fungus completely covers branches, it has an injurious effect on the physiological processes of the parts attacked. Another species of *Septobasidium* occurs also on lemons.

LEMON. SWEET RED LEMON. TIM HUNG NING MUNG. *Citrus limonia* Osbeck.

Black Spots. Undetermined.—The black spots are present on the leaves and branches. No cause could be assigned.

Canker. *Pseudomonas citri* Hasse.—The sweet red lemon is attacked seriously on leaf, stem, and fruit.

Lichens. Undetermined.—Lichens are severe.

LEMON. WHITE "NING MUNG." PAAK NING MUNG. *Citrus limonia* Osbeck.

Canker. *Pseudomonas citri* Hasse.—The white Chinese "Ning Mung" may be severely injured by citrus canker. The fruit, stem, and leaves become gravely diseased.

Sepiobasidium, lichens, and black spots, also occur on this type of lemon.

MANDARIN ORANGE. KAT. *Citrus nobilis* Lour.

Algae. Undetermined.—Green and brownish algae often grow on branches and leaves. The vitality of trees is reduced by the attack. The algae do not penetrate into the tissues.

Aschersonia aleyrodis Webb.—The fungus is parasitic on white flies and scale insects, and consequently is of great economic importance. It is characterized by a brown to cream-colored, circular, raised, crater-like growth, usually on the under-surface of leaves, but often on the upper surface also. The organism attacks only the white flies and the scales, and does not penetrate the leaf. In the Philippines it has been noted that scale insects are greatly increased on trees sprayed with Bordeaux mixture. This happens because the fungus parasitic on coccids is killed by the solution. The "Kat" is frequently severely attacked by the white fly, *Aleurocanthus citriperdus* Q. et B.,[5] and by scale insects. Such trees were observed to have an abundance of *Aschersonia*.

[5] Determination by A. C. Baker, Bureau of Entomology, Washington, D. C.

Black Mold. *Meliola citricola* Syd.—Leaves are often affected with a black sooty superficial growth. The fungus grows on the sugary secretion of aphids. The injury is slight, as a rule. On trees attacked severely, there is commonly a large number of wooly or other forms of aphids.

Black Spots. Undetermined.—The same disease that is found on lemons is present also on mandarins. Leaves and stems are affected. Apparently, little injury results.

Canker. *Pseudomonas citri* Hasse.—The canker on all plants of this species is relatively slight. Few leaf infections may be present, and, commonly, no great damage is done.

Lichens. Undetermined.—Lichens are commonly found in abundance on the trees. Serious losses result in many instances. The trouble is more fully discussed under sour red lemon.

Witches Broom. Undetermined.—Frequently, witches brooms, which are characterized by an abnormal production of twigs at the ends of branches, are present in abundance on the trees. The cause could not be determined in the limited time of the inspection. Also, a rosetted condition may occur.

ORANGE. *Citrus sinensis* Osbeck.

Aschersonia aleyrodis Webb.—*Aschersonia* is found in abundance growing on leaves attacked by scales (Plate II, fig. 5). The organism is very effective in killing scale insects, and is similar to that found on other citrus species. *Chrysomphalus ficus* Ashm. (*aonidum* (Linn.), *Lepidosaphes beckii* (Newm.), *Lepidosaphes gloverii* (Pack.), *Parlatoria pergandii* Comst., and *Parlatoria zizyphus* (Lucas)[6] are some of the scales that are found in large numbers on branches and leaves of orange trees.

Bark Rot. Undetermined.—A rot of the bark similar to that found in the Philippines is common on orange trees in Kwang Si and Kwang Tung Provinces. The disease is caused probably by a form of *Diplodia*. At first, small black soft rotted areas are produced. Later, these increase in size, and then the bark rots and falls off. The affection is usually accompanied by a frothing. In well-cared-for orchards no serious harm is done. Old, neglected trees are primarily affected.

Black Mold. *Meliola citricola* Syd.—A black mold like that on other citrus is frequently found on orange leaves. The fungus grows superficially on the secretions of aphids, and consequently does no harm. The woolly aphids may be present in great abundance on trees.

Black Spot. Undetermined.—The black, greasy spots found on the leaves and stems of other citrus species are also prevalent on oranges. The cause was not determined.

Borer.—A stem borer of citrus causes enormous losses. Many times the trunks of trees are so severely weakened as to result in death. The borers open the way for fungi causing heart rots. *Schizophyllum commune* Fr. grows on dead trunks.

Canker. *Pseudomonas citri* Hasse.—Generally little canker is observed on the various types of oranges (Plate II, fig. 4). In special cases, severe attacks are noticed. The symptoms are similar to those discussed under lemon.

[6] Determination by Harold Morrison, Bureau of Entomology, Washington, D. C.

Die-Back.——Trees grown under unfavorable conditions exhibit a serious die-back of the branches. The cause appears to be improper cultural methods. Inter-cropping is, in many instances, over-practiced, if a high citrus yield is the primary aim. Oranges are in some instances inter-planted with mulberry, plums, bananas, and gabi. Sugar cane, beans, and gabi are frequently all used at the same time as inter-crops. Such trees are necessarily over-crowded and as a consequence are weakened because of lack of nutrition and proper cultivation.

Leaf Spot. Undetermined.—Often, following the ravages of the leaf miner (*Phyllocnistis citrella* Stainton), partially parasitic fungi gain an entrance to the leaf and cause a leaf spot. The invasion of the larva of the *Phyllocnistis* moth is severe and causes much loss, especially to nursery stock (Plate II, fig. 3). The larvae also spread the citrus canker.

Lichens. Undetermined.—Long mossy, and other lichens grow in abundance over trees in the flooded regions (Plate I, fig. 1). They are present in such numbers as to greatly weaken the trees. A six per cent wash of copper sulphate used on the trunk and larger branches is effective as a control.

Mottled Leaf. Physiological.—Definite yellowed areas between the green colored main veins of the leaves is a common trouble. The cause of this malady is apparently some lack of food materials in the soil, or some disturbance of the normal activity of the trees.

Rosette.—In certain localities, a rosetting of the leaves is common. The trouble is apparently caused by some abnormal physiological condition of the plant. No fungi were found to he associated with the disease.

Scab. *Cladosporium citri* Massee.—The common scab as described on other citrus is found also on the oranges. Generally, the attack is not severe.

Septobasidium albidum Pat.—Coccids are attacked also by a *Septobasidium.* The fungus may cause some injury to the tree by growing over branches infected with scale and in this way upset the normal physiological functions. The reduction of scale insects will control the fungus. Another *Septobasidium* grows on the twigs of orange (Plate I, fig. 6).

Snails. Undetermined.—On citrus growing in damp locations many snails may inhabit trees. Their presence seems to cause no injury.

Yellowing.—Trees grown under unfavorable conditions, as on poor soil and in heavily inter-cropped areas, exhibit an unhealthy yellowed appearance. In certain instances yellowing occurs in apparently well-cared-for orchards. The trouble in these cases may be from nematode attacks. A careful laboratory examination of such trees was not made. An excessive amount of water in the soil will cause a yellowing.

PUMMELO. *Citrus grandis* Osbeck.

Algae. Undetermined.—As a common thing the leaves are covered with different species of algae. Lichens and algae are in greatest abundance in orchards situated in damp locations.

Aschersonia aleyrodis Webb.——*Aschersonia* is usually prevalent on leaves attacked by scales. The fungus is parasitic on aleurodids and coccids, and con-

sequently is beneficial. The leaf is not penetrated. The organism is similar to that on lemon trees. The white fly, *Aleurocanthus citriperdus* Q. et B.[7] attacks the pummelo.

Black Mold. *Meliola citricola* Syd.—Not rarely, leaves are found covered with a black superficial growth. The fungus is on the leaf surface, growing on the secretions of aphids. No injury is done.

Black Spots. Undetermined.— Black shiny spots are produced on leaves and stems. The cause of this trouble could not be ascertained during the short inspection trip. The disease is similar to that on lemons and oranges.

Canker. *Pseudomonas citri* Hasse.—The canker may be severe on most varieties of pummelos. Apparently different forms show differences as to susceptibility. Leaves, stem, and fruit are attached (Plate I, fig. 3, 4). The disease is similar to that discussed under lemon. The canker organism is present on trees growing above Wuchow, in Kwang Si, as well as through Kwang Tung Province. The famous sand field pummelo or "Sha Tin Yau" of the Tang Yun district in Kwang Si is also attacked, but usually the older trees are not seriously affected.

Epiphytes. *Loranthus parasiticus* (Linn.) Merr.—Trees commonly are attacked severely by the plant parasite. In some cases the epiphyte grows completely over the trees. It spreads over the branches of citrus and forms root-like structures, or haustoria, which penetrate the tissues (Plate II, fig. 1, 2). The plant is spread by seeds being carried from tree to tree by birds. The parasite can be easily controlled by pruning out.

Lichens. Undetermined.—Lichens may be severe on stems, branches, and leaves. Various species are present.

Scab. *Cladosporium citri* Massee.—Scab may at times be severe. It attacks leaves primarily, but is found also on the fruit. The disease is similar to that discussed under lemon.

Septobasidium.—The branches of pummelo, especially those severely attacked by scale, may be affected by a species of *Septobasidium.* The fungus is superficial, being parasitic on scale insects, and may be recognized by its brown, thick, leathery growth. Severe damage may be done when a large proportion of a tree is covered. The chief damage, however, is undoubtedly done by scales. Various species of scales, round, and oyster shell, are often in abundance. These include the following: *Lepidosaphes beckii* (Newm.), *Lepidosaphes gloverii* (Pack.), *Parlatoria pergandii* Comst., and *Pseudaonidia trilobitiformis* (Green.)[8]

On dead leaves may be found a species of *Diplodia.* And dead twigs are attacked by *Heterochaete tenuicula* (Lév.) Pat., *Tryblidiella rufula* (Spreng.) Sacc., and a *Phoma.* The *Phoma* may be similar to *Phoma omnivora* McA., or *Phoma citricarpa* McA., both of which give rise to diseases of citrus. The particular species collected was, however, upon dead twigs. Apparently it is not parasitic or, if so, only slightly. Although careful examination was made for a parasitic form of *Phoma,* none was found.

TANGERINE. GUM. *Citrus nobilis* Lour.

Scab. *Cladosporium citri* Massee.—The "gum," or small tangerine, is ferquently severely attacked by scab on the leaves and fruit (Plate II, fig. 6). The disease is similar to that found on lemons.

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[7] Determination by A. C. Baker, Bureau of Entomology, Washington D. C.
[8] Determinations by Harold Morrison, Bureau of Entomology, Washington, D. C.

Black spot disease, witches broom, rosette, lichens, *Septobasidium*, and *Aschersonia aleyrodis* Webb. are present also on the "Gum". Little or no canker is present. The *Septobasidium* is a different species from that discussed under lemon.

CITRUS RELATIVES.

Severina buxifolia Tenore.

Algae. Undetermined.—Leaves may be attacked by parasitic algae. Little damage is done. Black, circular, raised spots of the organism are characteristic of the trouble.

Black Mold. *Meliola.*—A similar superficial black mold may cover the leaves as with *Citrus* species.

Galls. Insect galls are frequently present on stems.

WAMPI. *Clausena lansium* Skeels.

Black Mold. *Meliola.*—A *Meliola* type of fungus frequently gives rise to black sooty spots. Since the organism lives superficially on the leaves, obtaining its food from the sugary secretion of aphids, the plant is not injured. The fungus may be the same species that is found on the various species of *Citrus.*

Epiphytes. *Loranthus parasiticus* (Linn.) Merr.—This parasitic epiphyte causes severe destruction by growing over the trees. The plant bears haustoria, or root-like structures, that pierce the host and absorb food materials. In severe cases of attack, the foliage of *Loranthus* may replace almost completely that of *Clausena.* The parasitic plant can be kept easily under control by merely pruning it out.

Lichens and Algae. Undetermined.—In damp locations the trunks and branches of trees may be covered with lichens and algae.

COFFEE. *Coffea arabica* Linn.

Leaf Blight. Undetermined.—Very little injury is done by the blight. Coffee culture was encountered on this trip in only one isolated section of the Paak Shan region in Kwang Tung. The destructive rust, caused by *Hemileia vastatrix* B. et Br., was not present. If coffee culture is ever undertaken, the rust should be excluded by strict quarantine and inspection methods.

CONDOL. CHEUNG TSAT KUA. CHE KUA. *Benincasa hispida* (Thunb.) Cogn.

Bacterial Wilt. *Bacillus tracheiphilus* Erw. Smith or *Bacillus solanacearum* Erw. Smith—Entire fields of the *Benincasa* melon are destroyed. The first symptom of the disease is a wilting. Later, the plants turn yellowish; they then become brown and die. The root system remains apparently healthy. Microscopic examination showed the malady to be of bacterial origin; the xylem tubes of the vascular bundles were completely clogged with bacteria. As no cultures were made, it could not be determined whether the disease was caused by *Bacillus tracheiphilus* Erw. Smith or *Bacillus solanacearum* Erw. Smith. In cases of severe infection, a five-year period should be allowed in which no cucurbits or solanaceous plants are grown.

Downy Mildew. *Pseudoperonospora cubensis* (B. et Br.) Rost.—The common downy mildew causes serious damage. The symptoms are similar to those discussed under cucurbits. Spraying with Bordeaux mixture is an effective control measure.

Powdery Mildew. Erysiphaceae. Frequently, a white powdery growth is produced over the leaves of *Benincasa*. The same fungus attacks practically all of the plants in the cucurbit group. Only the imperfect or conidial stage was observed by the writer. Dusting with sulphur or spraying with any standard fungicide, such as Bordeaux mixture, may be used to control the disease.

CORN. *Zea mays* Linn.

Leaf Blight. *Helminthosporium inconspicuum* C. et E.—A severe leaf spotting is often found in corn plantings. Leaves and tassels are affected. On the leaves, are present at first, minute brown spots. They gradually increase in size, become elongated with the axis of the leaf, and have dark, dirty, grayish to black centers with brown borders. A black mold is formed on the tassels. The fungus is also found on corn in the compost pile. Crop rotation ought to be carried out. Compost from diseased corn should not be put on fields to be planted with corn.

Leaf Specks. Undetermined.—A superficial fungus may be found growing on the leaves and stems. The disease is characterized by small roundish raised specks on either surface of the leaves. The organism undoubtedly is parasitic, because a yellowing is always present around the black fungus body. The same attack was observed on other plants. Little or no loss results.

The downy mildew of corn produced by *Sclerospora maydis* (Rac.) Butl. was not observed during the month of the inspection. The smut caused by *Ustilago zeae* (Beckm.) Unger was reported to be present, but was not seen by the writer.

COTTON. *Gossypium.*

Leaf Spot. *Mycosphaerella gossypina* (Cke.) Atk. (*Cercospora gossypina* Cke.)—Cotton leaves commonly have a leaf spotting that does little damage. Young infections are circular and light brown, older ones have grayish centers bordered with a dark brown ring. Many times, blotches are formed because of the union of spots. Badly diseased leaves yellow and finally drop off. *Cercospora* spores only were formed.

Rot of Flowers. *Rhizopus nigricans* Ehr.—Old mature and weakened petioles of flowers are commonly covered with a black mold. Apparently no serious destruction results.

COWPEA. (MEDIUM LONG.) *Vigna sinensis* (Linn.) Endl.

Black Mold. *Meliola.*—The leaves of cowpeas may become covered with a black mold of the *Meliola* type. The fungus grows superficially on the secretion of aphids. Little damage is done.

Leaf Spot. *Cercospora.*—Irregularly circular spots with gray centers, bordered with a purplish to red ring are often found in abundance on the leaves. the attack is usually not serious enough to harm the plants.

Leaf Spot. *Vermicularia.*—Whitish spots may be present on leaves. A fungus undoubtedly of the genus *Vermicularia* was associated with the trouble.

Rust. *Uredo vignae* Bres.—The crop may be destroyed by the rust fungus attacking the leaves. Brown sori are borne in abundance on the lower surface and on the petioles of leaves. In general, a brown dust of spores is found on the under leaf surfaces. Crop rotation is efficacious as a control. Some varieties of cowpeas, apparently, are somewhat resistant.

COWPEA. (VERY LONG.) *Vigna sinensis* (Linn.) Endl.

Leaf Spot. *Cercospora.*—The common gray centered leaf spot is formed on this variety of cowpeas. The infection in most cases is not serious.

Rust. *Uredo vignae* Bres.—The leaves are often severely attacked by the rust fungus. The character of the disease is similar to that discussed under the other types of cowpeas. A rotation of crops is beneficial.

CUCUMBER. WONG KUA. *Cucumis sativus* Linn.

Downy Mildew. *Pseudoperonospora cubensis* (B. et C.) Rost.—Cucumber leaves are often severely diseased with the common downy mildew fungus that is found on gourds, melons, and squashes. At first rather angular yellow spots are formed. Later, in severe attacks, the whole leaf turns yellow, shrivels, and dies. Usually, the centers of infections turn brown, become brittle and crack. The under surface of affected areas exhibit a downy white to gray growth. Older leaves generally show the disease first. Production of fruit is decreased. Spraying with Bordeaux mixture will reduce the attack.

DATE PALM. *Phoenix.*

Leaf Spot. *Graphiola phoenicis* (Moug.) Poit.—Numerous black raised horny bodies are present on the leaves. In severe cases of infection much injury is done. The fungus also attacks the midrib and leaf petioles. Badly diseased leaves should be cut off and burned. Spraying with Bordeaux mixture is effective.

EGG-PLANT. *Solanum melongena* Linn.

Bacterial Wilt. *Bacillus solanacearum.* Frw. Smith.—A wilting of otherwise apparently healthy plants may take place. Such plants first wilt and then soon die. The trouble is present in practically all large fields, but never seems to be extremely serious. Isolated plants or small groups of plants are found to be wilted.

In the delta region most vegetables are grown on raised beds. The beds are watered frequently, and the excess water seeps out into ditches between the beds. It appears probable that the bacteria present in the soil are washed out by this watering and in this manner are kept from spreading. Crop rotation is practiced; this also would tend to reduce the disease. Heavy infection would be suspected under the intensive system of gardening employed. All diseased plants should be pulled up and burned, and the crops should be rotated.

Leaf Spot and Fruit Rot. *Phyllosticta hortorum* Speg.—The leaves of egg-plant are seriously affected by the fungus. The malady is characterized by irregular spots with brownish gray centers bordered with a darker brown. Within the center develop numerous minute black specks. The fungus may also spread to the fruit causing a serious rot. Irregular, sunken, light brown areas, with darker brown edges are formed over the fruits. Minute black specks are in the light

brown. Eventually, the entire fruit becomes diseased and falls off. All infected fruit and leaves should be collected and burned. Spraying with Bordeaux mixture at intervals of from two weeks to one month will control the disease.

FIG. *Ficus carica* Linn.

RUST. *Kuehneola fici* (Cast.) Butl.—The rust is severe and causes defoliation during favorable damp weather. Raised, brownish sori are found in abundance on the under leaf surface. The corresponding upper surface is characterized by small yellowish spots. Spraying with Bordeaux mixture will serve as an effective control.

FORAGE CROPS.[9]

Andropogon.

LEAF SPOT. *Phyllachora andropogonis* Karst. et Har.—Black shiny bodies of the fungus penetrated the leaves and are scattered over the surfaces.

SMUT. Undetermined.—The heads of certain varieties may be entirely smutted.

Andropogon micranthus Kunth.

RUST. Undetermined.—Elongated rust sori are scattered over the leaves, causing a good deal of harm.

Apluda mutica Linn.

SMUT. Undetermined.—The heads of this grass are in some cases seriously smutted.

Arundinella.

RUST AND *Phyllachora.* Undetermined.—A rust and a *Phyllachora* are present in abundance. Both have not been as yet identified.

Cynodon

RUST. Undetermined.—Rust sori are in some instances scattered in abundance over the leaf surface.

Cynodon dactylon (Linn.) Pers.

LEAF SPOT. *Phyllachora cynodontis* (Niessl.) Sacc.—A severe leaf spotting is usually present on this grass. Black shiny bodies of the fungus penetrate and are scattered over the leaves. Affected plants are weakened and stunted.

SMUT. Undetermined.—The heads are commonly severely smutted.

Digitaria sanguinalis (Linn.) Scop.

RUST. Undetermined.—Rust spots are often scattered in abundance over the leaves.

Imperata cylindrica Beauv.

RUST. *Puccinia rufipes* Diet.—Leaves commonly are attacked by the rust producing fungus.

Ischaemum aristatum Linn.

SMUT. *Ustilago tonkinensis* P. Henn.—The inflorescence is sometimes severely smutted.

Ischaemum ciliare Retz.

LEAF SPOT. *Phyllachora.* Undetermined.—Leaves may be affected.

SMUT. *Ustilago tonkinensis* P. Henn.—The inflorescence may be badly smutted.

Miscanthus sinensis Anders.

RUST. Undetermined.—Leaves are frequently seriously affected.

Panicum repens Linn.

LEAF SPOT. *Phyllachora graminis* (Pers.) Fuckel—The common black *Phyllachora* spot is in some cases found in abundance on the leaves.

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[9] All forage crops are arranged alphabetically according to their scientific names.

RUST. *Uromyces linearis* B. et Br.—The leaves are often badly affected by the rust fungus.

Paspalum scrobiculatum Linn.

HEAD DISEASE. *Cerebella paspali* Cke. et Mass.—The entire inflorescence is, in some instances, affected. A smooth whip like mass is produced in place of the head.

LEAF SPOT. *Phyllachora graminis* (Pers.) Fuckel.—The leaves frequently are badly affected with the black fungus bodies.

RUST. Undetermined.—The leaves are infected.

Phragmites vulgaris (Lam.) Trin.

RUST. Undetermined.—Leaves are affected.

Scirpus grossus Linn. (*Cyperus difformis* Blanco).

RUST. Undetermined.—The leaves are frequently seriously infected with a rust fungus.

Sporobolus elongatus R. Br.

HEAD DISEASE. *Cerebella paspali* Cke. et Mass.—The inflorescence is diseased similar to that of *Paspalum*.

LEAF BLIGHT. *Helminthosporium ravenelii* B. et C.—Brown spots and blotches may be developed on the leaves.

RUST. Undetermined.—Leaves may be seriously infected.

GABI. *Colocasia esculenta* (Linn.) Schott. (*Colocasia antiquorum* Schott.)

BLIGHT. Undetermined.—The disease has the general characteristics of the common blight produced by *Phytophthora colocasiae* Rac.; but spores of this fungus could not be obtained from the collected material. The infected portions are recognized by leaves blighted at the margins, or by definite irregular blotches produced over the surface. The trouble may be due to lack of water.

GERANIUM. *Pelargonium*.

LEAF SPOT. *Cercospora*.—Black, irregularly circular spots are often observed on leaves, causing, however, no serious injury. The common and the cut-leaf geranium are both affected.

GINGER. *Zingiber officinale* Rosc.

ROOT ROT. Undetermined.—The malady was reported to be serious. It is characterized by a yellowing, followed by the death of the leaves. Plants thus affected have a rot of the root. The disease may be due to bacteria or to the attacks of some phycomycete. Infected plants should be dug up and burned during the early stages of the disease.

Leaf blight was in evidence in practically all plantings, but was not serious. An examination of such leaves yielded *Helminthosporium* and *Fusarium* spores. The disease is apparently due to the *Helminthosporium; Fusarium* appears to follow as a saprophyte.

GRAPE. *Vitis*.

LEAF SPOT. *Cercospora viticola* (Ces.) Sacc.—Irregular, dark brown to black spots are frequently observed on the leaves. A black mold is formed on the under surface. Attacked plants are only slightly weakened.

GUAVA. *Psidium guajava* Linn.

Black Mold. *Aithaloderma clavatisporum* Syd.—A black sooty mold commonly develops over the leaves of guava. The fungus lives on the sugary secretions of aphids and is generally not harmful.

GUIN-GUIN. *Euphoria longana* Lam.

Algal Leaf Spots and Lichens. Undetermined.—Algae and lichens may be thickly scattered over leaves and stem. The algae apparently are parasitic. The vigor of plants is impaired by upsetting the normal physiological activities of the plants.

HOLLYHOCK. *Althaea rosea* Cav.

Leaf Spot. *Cercospora althaeina* Sacc.—Irregularly circular, blackish spots are often found in abundance on the leaves. In cases of severe infection, especially on the lower leaves, defoliation takes place.

KOHLRABI. CABBAGE. *Brassica oleracea* Linn.

Leaf Spot. *Alternaria brassicae* (Berk.) Sacc.—The disease is described more fully under cabbage. Black circular spots with concentric rings are scattered over the leaf. Often the attack is serious enough to cause the loss of a rather high proportion of the plants.

LABLAB BEAN. *Dolichos lablab* Linn.

Orange Galls. *Woroninella dolichi* (Cke.) Syd.—Leaves and stems are seriously attacked. Yellowish to orange rust like pustules or galls may be found in abundance. Young leaves when severely infected are stunted, become thickened, and assume abnormal shapes. Diseased stems are gnarled and abnormally enlarged. The fungus undoubtedly attacks the pods also. Seriously affected plants should be pulled up and burned. Spraying with Bordeaux mixture will prevent the spread of the organism.

LETTUCE. *Lactuca sativa* Linn.

Leaf Spot. *Cercospora.*—As a common thing, the lower leaves are spotted to such an extent as to make them unsalable. The affected parts have gray centers, bordered with a brownish ring. Old diseased leaves should be collected and burned, or fed to live stock.

LIMA BEAN. *Phaseolus lunatus* Linn.

Anthracnose. *Colletotrichum lindemuthianum* (Sacc. et Magn.) Bni. et C.—The climbing varieties of lima beans are attacked by the widely known pod spot, or anthracnose. Dark colored, usually sunken spots, are produced on the pods. The affected parts are bordered with a reddish ring. In the centers of the older infections are formed masses of pinkish spores. The fungus penetrates the pod and the seeds. Leaves or stems were not observed to be attacked. Seeds used for planting should be selected from healthy pods. All diseased parts should be collected and burned. Crop rotation will have to be practiced where severe cases of infection occur.

Leaf Spot. *Cercospora.*—A spotting similar to that discussed under *Phaseolus vulgaris* Linn. is found also on the lima beans. The fungus does little injury.

A black mold may be formed on dead pods and stems. The identity of the fungus is not known.

LITCHI. LYCHEE. *Litchi chinensis* Sonn.

Leaf Galls. Produced by insects.—The most injurious affection on lychee is three different types of leaf galls produced by insects. As a common thing entire branches of leaves are attacked. The symptoms of the usual gall formation is a thickened, wrinkled leaf. On the affected portions are formed many abnormal hairs of a brown color with a velvet-like appearance. A second type of gall is evidenced by a somewhat spherical enlargement without the numerous hairs. The third type is a minute gall in the form of a slightly enlarged portion around the insect puncture.

Leaf Spots. Undetermined.—The lychee tree is remarkably free from all injurious fungus attacks. The tree apparentlhy is very healthy, with waxy, resistant leaves and a healthy bark. A black superficial leaf mold caused by a fungus of the *Meliola* or *Capnodium* type is present, but never in a serious form. Minute black specks of a fungus of the *Micropeltis* form may also be observed.

Lichens and Algae. Undetermined.—Lichens and algae may be found in abundance on the trunk, branches, and often the leaves. The trees, however, in general are not so severely attacked as the citrus.

MANGO. *Mangifera indica* Linn.

Leaf Blight. *Pestalozzia pauciseta* Sacc.—Leaves may be blighted. Dirty, grayish, irregular blotches, originating at the margins, are the chief symptoms. Within the gray are developed many minute black specks, the fruiting bodies of the fungus. No serious loss results.

MILLET. *Setaria italica* (Linn.) Beauv.

Downy Mildew. *Sclerospora graminicola* Schroet.—Severe damage is produced in plantings of millet. Diseased leaves are recognized by a yellowing or whitening. In older infections the leaves turn brown and die. A shredding was not observed. Dark brown stripes indicate the presence of oospores, which are borne in great abundance. Severely infected young plants are stunted and finally killed. It is advisable to pull up and burn all infected plants.

Leaf Blight. *Helminthosporium.*—Brown elongated spots develop on leaves. No serious destruction was observed.

Rust. *Uromyces setariae-italicae* (Diet.) Yosh.—Brown rust sori, arranged in stripes parallel with the axis of the leaf, are formed in great abundance. Considerable damage may be done. Uredospores only were observed.

A rust similar to *Uromyces setariae-italicae* (Diet.) Yosh. is present also on leaves of *Setaria glauca* Beauv.

MILLET, AFRICAN. *Eleusine corocana* (Linn.) Gaertn.

Shoot Blight. Undetermined.—The central shoots of young plants are commonly browned and dead. A leaf blight is also associated with the trouble. Crop failures result from the infection. *Helminthosporium* spores were found on diseased plants.

MULBERRY. *Morus alba* Linn.

Leaf Spot. *Phyllosticta.*—Circular gray spots may arise on leaves. Within the center of the gray are minute black specks which upon microscopic examination prove to be pycnida, with characteristic *Phyllosticta* spores. Severe destruction may result.

Powdery Mildew. *Phyllactinia suffulta* (Rebent.) Sacc.—The serious powdery mildew causes enormous destruction in all mulberry regions about Canton, and other silk growing sections in Kwang Tung province. A white powder is formed on the lower surface of leaves, the upper surface being correspondingly browned. In severe cases defoliation may take place. The lower leaves are usually the ones diseased. Perfect spores were found in abundance on material sent in from Foochow, China, but no such spores were observed on the material collected in southern Kwang Tung, China. Although infected leaves are not readily eaten by the silk worms, the worms were, at times, observed eating portions of diseased leaves. All infected leaves should be collected in a separate basket and then destroyed by burning.

Rust. *Aecidium mori* (Barcl.) Diet.—The *Aecidium* rust attack is slight, as it was observed in the Agricultural Experiment Station and in the mulberry sections about Sui Lam, Kwang Tung. The fungus gives rise to raised orange-colored pustules in greatest abundance on the lower surface of leaves. A slight depressed and yellowed area is formed on the upper surface directly above these aecidial spots.

Rust. *Kuehneola fici* (Cast.) Butl. var. *moricola* P. Henn.—The disease is present in all mulberry sections. Severe damage may result. Affected leaves have raised brownish sori with a rusty powder of spores on the under surface. The upper surfaces of such leaves are bronzed. Severely infected leaves are avoided by the silk worms, although in certain cases they were observed to eat such leaves. All badly-diseased leaves should be collected and burned.

Stem Borer.—The trunks of mulberries are often seriously weakened by a stem borer. In many cases trees are killed. The borer opens a way for the attack of heart rot fungi.

ONION. *Allium cepa* Linn.

Black Mold. *Macrosporium commune* Rab.—Old and weakened leaves, stems, and seed stalks of onion are commonly covered with a velvety black mold. The fungus apparently follows some injury or weakening of the plant. To prevent the disease, plants should be kept in as vigorous and healthy a condition as possible.

OPO. UPO. HOI LU POO. *Lagenaria leucantha* (Lam.) Rusby.

Downy Mildew. *Pseudoperonospora cubensis* (B. et Br.) Rost.—The common phycomycete may severely attack *Lagenaria*, "Hoi Lu Poo," a gourd-like melon and the "*Poo Kua*," or common long melon variety. Angular, yellowish to brown spots are produced in abundance on the leaves. The characters of the disease are similar to those discussed under downy mildew of cucurbits. Spraying with Bordeaux mixture will reduce the losses.

Powdery Mildew. Erysiphaceae.—A powdery mildew may develop over the surface of leaves; but occasions little or no injury. Perfect spores were not observed. An effective control is dusting with sulphur or spraying with a standard fungicide.

PALM. *Livistona chinensis* R. Br.

Leaf Spot. *Graphiola cylindrospora* Syd.—The lower leaves are seriously diseased. Black, horny, raised fungus bodies are thickly scattered over the leaf surfaces, on the midribs, and on the petioles. A white powdery crystalline mass is often found on the upper surfaces of the fungus bodies. All badly diseased leaves should be cut off and burned. An effective control is spraying with Bordeaux mixture.

PALM, FISH-TAIL. *Caryota ochlandra* Hance.

Leaf Blight. *Pestalozzia palmarum* Cke. et Grev.—Gray blotches extending from the leaf margins are common. With the diseased areas are developed minute black specks, the fruiting bodies of the fungus. No harm commonly results.

PANSY. *Viola tricolor* Linn.

Leaf Spot. *Cercospora.*—Irregularly circular, blackish spots develop on pansy leaves. Usually, plants suffer little.

PAPAYA. *Carica papaya* Linn.

Leaf Blight. Undetermined.—The leaves of papaya are commonly blighted at the edges. The cause may be a lack of water. Within the gray dead portions frequently are found spores of *Helminthosporium* and *Alternaria.*

PATOLA. *Luffa acutangula* Roxb.

Downy Mildew. *Pseudoperonospora cubensis* (B. et Br.) Rost.—The common downy mildew fungus severely attacks the long, angular, fluted, green cucurbit. The symptoms and control are similar to those discussed under "Amargoso," *Momordica charantia* Linn.

PEA, BLUE LUKTAN. *Phaseolus* ("*radiatus*" group).

Powdery Mildew. Erysiphaceae.—The blue pea is often severely attacked by a fungus that produces a powdery mildew. Leaves, pods, and stems are affected. Dusting with sulphur will aid in checking the disease.

PEACH. *Prunus persica* Benth et Hook.

Black Mold. *Meliola* or *Capnodium.*—Leaves are often entirely covered with a black superficial fungus that shades the chlorenchyma and reduces the vitality of the plant. The organism usually follows the attacks of aphids or other insects that secrete a sugary liquid. Spraying with a standard fungicide will control the disease.

Borer.—The attack of borers in the trunk of trees often cause their death. Various forms of the woody, higher basidiomycetes develop on such weakened and dead trees. *Fomes fasciatus* Lév. grows on weakened trees, and *Polystictus sanguineus* Linn. on dead stumps.

Fruit Rot. Undetermined.—A fruit rot was reported to be serious; but as the inspection was made before the peach fruits were mature no determination of the casual organism could be made. The disease may be caused by *Sclerotinia fructigena* (Pers.) Schroet. Fallen rotted fruits are frequently infected with a *Lasiodiplodia*. If the disease is the common brown rot, spraying with self boiled lime sulphur is an effective control.

Gummosis. Undetermined.—The most serious disease is a severe gumming of the trunk and branches. In many cases piles of gum, ten centimeters thick and thirty to sixty centimeters in diameter, collect under the trees. Whether the disease was due to a fungus or to some cultural physiological trouble could not be ascertained.

Rust. *Puccinia pruni-spinosae* Pers.—A severe rust of the leaves is of common occurrence. The malady is characterized by the production of small round, brown rust sori on the under surface of the leaf. The corresponding upper surface is yellowed in small spots. A self-boiled lime sulphur spray will control the disease.

Scab. *Cladosporium carpophilum* Thüm.—Black, almost circular spots develop on the fruit. In severe cases, the infected areas run together, forming a blotch. Later, such portions usually are cracked. The organism is the same as that found on the leaf, producing a shot hole. No evidence of infection was noticed on the stems. A satisfactory control is spraying with self-boiled lime sulphur.

Scale. *Aulacaspis pentagona* (Targ.)[10]—While this trouble is not of a fungus nature it is mentioned because of its severity. The entire branches of infected trees may be covered. Such trees are sickly at first, being yellowed, and later die.

Shot Hole. *Cladosporium carpophilum* Thüm.—The same organism giving rise to scab may infect the leaves of peach. At first distinct brown spots are formed. In later stages, the disease is characterized by a falling out of the affected areas, resulting in a shot-holing (Plate III, fig. 5). Extreme injury very often occurs. The entire margin of leaves may be infected and consequently be scalloped due to the death and removal of the diseased parts (Plate III, fig. 5). As a common thing spots run together forming blotches. The most beneficial control is spraying with self-boiled lime sulphur.

Yellowing.—A yellowing of leaves indicates a general lack of vigor in the trees. The disorder may be due to a lack of certain elements in the soil or to some abnormalities of the root system. No true "yellows" was encountered.

PEANUT. *Arachis hypogaea* Linn.

Leaf Spot. *Septogloeum arachidis* Rac.—The disease may be extremely destructive on certain varieties. Lower leaves are first affected. Such leaves when seriously attacked fall off. The spots are circular, black to brown in the center, and bordered with a yellowing of the surrounding leaf tissue. The centers of the infections, in general on the under surface of leaves, are characterized by masses of roundish, raised, fruiting bodies. The fungus may be found also on the stem. Crop rotation and the growth of resistant varieties will reduce the losses.

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10 Determination by Harold Morrison, Bureau of Entomology, Washington, D. C.

Root Rot. *Sclerotium.*—Frequently, yellowed and dead plants are scattered throughout a planting. Such plants have a rot of the root. The malady undoubtedly is the same as in the Philippines, being produced by a *Sclerotium*, which was found in China to be present in the soil of various market gardens. No sclerotial bodies were observed on the diseased peanuts.

PEAR. SHA-LEE. *Pyrus communis* Linn.

Rust. *Gymnosporangium japonicum* Syd.—The rust of the pear leaf may be recognized by yellow to orange spots on the upper surface of the leaf. On the lower surface are developed characteristic yellow, fringe-toothed cluster cups (Plate III, fig. 4). The leaves may be seriously attacked. The fungus passes only part of its life cycle on the pear leaf, the remainder being carried out on a cedar (*Juniperus*). The latter plant, known as an alternate host, bears the familiar "cedar apple". In a control, all cedar trees in the vicinity of the pear orchard should be removed. Spraying with Bordeaux mixture, also, ought to be practiced.

PECHAY. *Brassica pekinensis* (Lour.) Skeels.

Leaf Spot. *Alternaria brassicae* (Berk.) Sacc.—Pechay is, in many cases, seriously spotted. Young infections are brown to black and irregularly circular. Older spots have gray centers surrounded with concentric rings of brown. *Alternaria* spores are associated with the affected parts, and the fungus appears to be *Alternaria brassicae* (Berk.)Sacc. All badly diseased plants should be pulled up and burned. Crop rotation will reduce the attack.

PEPPER, GREEN. *Capsicum annuum* Linn.

Fruit Rot. *Vermicularia capsici* Syd.—Soft, often circular, sunken spots are formed on the fruits. The center of the spots usually dry, forming concentric rings, within which are produced small black spore-bearing bodies (Plate III, fig. 1). The disease is common, causing a serious rotting of the fruit. All diseased peppers should be collected and burned. The rot can be prevented by spraying with Bordeaux mixture.

Leaf Spot. Undetermined.—Irregular black spots are produced primarily on the under-surface of leaves. In some cases the infection spreads through the leaf. Slight injury is done.

Powdery Mildew. Erysiphaceae.—The surfaces of leaves are covered with a white powdery growth. Severely diseased leaves turn yellow and drop off. Dusting with sulphur, or the use of any standard spray mixture, will serve as a control.

PINEAPPLE. *Ananas comosus* (Linn.) Merr. (*A. sativus* Schultes f.)

Leaf Blight. Undetermined.—A leaf blight is present in great abundance. Much damage is done either by lowering the vitality of the plants, or by killing the leaves. All pineapples observed growing in Kwang Tung were infected.

PLUM. *Prunus.*

Fruit Rot. Undetermined.—A fungus causing a soft rot is usually prevalent. After infection takes place the organism spreads rapidly in clusters of fruits. Lime sulphur should be used as a spray.

Lichens. Undetermined.—Lichens are severe on plum trees, growing in the delta regions, especially in the districts subject to floods. The trunks and branches are in many cases almost completely covered, and the normal physiological functions are disturbed. Painting with a six per cent solution of copper sulphate will kill the lichens.

Shot Hole. *Cylindrosporium padi* Karst.—Diseased leaves are characterized, at first, by a brown spot. Later, the affected tissue is cut off from the rest of the leaf, finally falling out and leaving a round hole. The infection is similar to that found on peach leaves. Serious damage may result because of the lowered vitality of affected trees. The fungus causing the disease is probably *Cylindrosporium padi* Karst. The disease can be controlled readily by application of lime sulphur.

RAMIE. *Boehmeria nivea* [Linn.] Gaudich.

Leaf Spot. *Cercospora.*—Leaves may bear gray centered spots with light brown borders. Little damage is done.

RICE. *Oryza sativa.* Linn.

Blast. *Piricularia oryzae* Br. et Cav.—As observed during May and June, a brown leaf spotting is the predominating symptom of the disease. Severe damage is done, frequently the entire leaves being killed. Brown, water-soaked areas also are developed at the sheath nodes. The rice had not advanced to a stage at which the effect of the fungus on the head was observed. Certain fields appeared to be more seriously attacked than others. Losses can be reduced by crop rotation.

Glume Spot. *Phyllosticta glumarum* Sacc.—Minute black specks are often formed on the glumes of weakened rice plants. The fungus apparently does little harm, as it appears to be growing only as a saprophyte on plants that have been killed or weakened. The common stem borer of rice was very much in evidence.

Stem Rot. *Sclerotium.*—The rice is attacked near the ground by a *Sclerotium.* When seedlings are affected they at first turn yellow, then brown, and die. Older plants may be stunted by the attack, and sterile heads are commonly the result. Within the tissues of the culms of old diseased plants may be found small brown sclerotial bodies. These bodies are also found on infected rice straw.

The following fungi were observed on old rice straw: *Coniosporium oryzinum* Sacc., *Macrosporium,* and a *Helminthosporium,* probably *Helminthosporium oryzae* Miy. et Hori.

RICE, WILD. *Zizania aquatica* Linn.

Rust. Undetermined.—The leaves of the wild rice are infected.

ROSE. *Rosa.*

Leaf Spot. *Cercospora rosaeicola* Pass.—The leaves of rose are frequently seriously affected with circular gray spots bordered with dark purple.

Rust. *Phragmidium subcorticium* (Shrank) Wint.—The leaves and stems of roses may be severely diseased with the true rust fungus. Small circular orange to yellow rust sori are developed on the leaf and stem Frequently, the entire lower surface of the leaf is covered with a yellow powder. All badly diseased parts should be cut out and burned. Spraying with Bordeaux mixture will reduce the destruction to a minimum.

SESAME. *Sesamum orientale* Linn. (*Sesamum indicum* Linn.)

Leaf Spot. *Cercospora sesami* A. Zimm.—A stem and pod infection may be present in abundance. Irregularly circular spots with gray centers, bordered with brownish or purplish rings are scattered over the infected regions. Severe damage results. Ordinary crop rotation will keep the disease under control.

A black mold on dead stems is due to *Helminthosporium sesameum* Sacc. A *Lasiodiplodia* also may grow as a saprophyte on dead stems.

SORGHUM. *Andropogon sorghum* Brot. (*Sorghum vulgare* Pers.)

Grain Mold. *Helminthosporium caryopsidum* Sacc.—A greenish to black mold may be present on the sorghum grains. Generally, no destruction results, but in severe cases of infection the vitality of the seeds undoubtedly is lowered.

Red Leaf Spot. *Colletotrichum graminicolum* (Ces.) Wils. (*C. lineola* Corda).—The most serious disease observed on sorghum was caused by *Colletotrichum*. Small plants are frequently killed and older plants seriously injured. Immature spots are circular and red. Older ones have a gray center, bordered with red or reddish brown. Within the gray areas may be observed the black fructifications of the fungus. Often, affected areas run together and form a blotch. Badly diseased leaves are much colored with red and dark reddish brown areas (Plate III, fig. 2). The fungus was observed to attack also the coat of the grain and the tassel. All severely diseased plants should be removed and burned. The malady can be minimized by crop rotation.

SOY BEAN. WANG TAN. *Glycine max* (Linn.) Merr. (*Glycine hispida* Maxim.)

Downy Mildew. *Peronospora trifoliorum* de Bary.—The downy mildew is serious in the majority of soy bean fields. A gray violet, downy growth is formed on the under leaf surface. The upper surface is yellowed in blotches. Often a wrinkling of the infected leaves occurs. Defoliation may take place in seriously diseased plants. Crop rotation must be carried out in order to reduce losses.

Rust. *Uromyces sojae* Syd.—The rust of soy beans commonly causes serious losses. In severe cases of attack, defoliation takes place. Brown rust sori are scattered thickly on the under surface of leaves. The upper surface is slightly yellowed in spots above the sori on the lower surface. The disease can be controlled by crop rotation.

SPINACH. COLITES. *Amaranthus viridis* Linn.

White Rust. *Albugo bliti* (Biv.) Kze.—Numerous small white galls are present principally on the under surface of the leaves. The corresponding upper surface is characterized by being pale yellow. Leaves are seriously dwarfed and malformed and the entire plants are stunted.

SQUASH. FAU KUA. *Cucurbita maxima* Duch.

Downy Mildew. *Pseudoperonospora cubensis* (B. et C.) Rost.—Leaves of squash are generally attacked. At first, angular, pale yellow spots are noticeable. Later, these affected parts turn to a brownish yellow. The centers of old spots become brittle, and portions frequently drop out. In severe cases of infection the diseased areas run together, forming blotches. The whole leaf may then turn yellow, shrivel and die. Older leaves appear to be attacked first. The downy mildew can be reduced by spraying with Bordeaux mixture.

Leaf Spot. *Alternaria.*—Brown circular spots are developed on leaves. On such affected parts are borne spores of an *Alternaria.* It cannot be stated definitely that this organism was the cause of the malady.

Powdery Mildew. Erysiphaceae.—A white powdery mass often covers the leaves. No perfect spores were found. Little injury is done. Dusting with sulphur or the use of any good fungicide will kill the organism.

STRAWBERRY. *Fragaria.*

Leaf Spot. Undetermined.—No fruiting bodies were borne on the specimens collected, but the disease had the appearance of lesions formed by *Mycosphaerella fragariae* (Tul.) Lindau. Spots have gray centers surrounded by a purple border. Throughout Kwang Tung province, strawberries, where grown, are infected. Only slight destruction was noted.

SUGAR CANE. *Saccharum officinarum* Linn.

Black Mold. *Meliola* or *Capnodium.*—Many times the leaves or even the entire plants may be covered with a superficial black mold. The fungus usually follows the attacks of aphids and mealy bugs, growing on the sugary secretion of these insects. Usually, little injury is done by the fungus, but it reduces the normal activities of the leaf by shading the chlorophyll-tissue. The aphids or mealy bugs cause most loss. The control of the insects concerned will entirely check this disease.

Leaf Spot. *Cercospora vaginae* Kr.—The leaf sheaths of sugar cane are commonly much reddened because of the attacks of the *Cercospora.* On the inner-surface of the affected sheaths is a blackish growth made up of the spores and spore-bearing bodies of the fungus. The vitality of the cane is somewhat lowered due to the attacks; but usually no severe losses result.

Red Rot. *Colletotrichum falcatum* Went.—The red rot is one of the most destructive of all the sugar cane diseases observed in Kwang Si and Kwang Tung Provinces. The malady is first characterized by a yellowing and then a browning of the leaves, starting in at the margins. Canes of such plants, when split longitudinally, may be seen to have reddish blotches or spots scattered throughout the internodes. These red areas are frequently confined at first to the vascular bundles, but later spread to the parenchyma tissue. In advanced cases, diseased canes are browned and shrunken. All infected plants should be destroyed. Since the disease is spread by infected cuttings, great precaution to exclude the fungus should be used in their selection. No cuttings with reddish spots in the interior of the cane ought to be used for planting. All injuries to the cane should be prevented. Ratooning ought not to be practiced in fields with serious infection. An effective control is crop rotation.

Rind Disease. *Melanconium sacchari* Massee—The stems of weakened plants are commonly affected with the rind disease. At first, a yellowing of diseased canes is observed. Later, the leaves dry and the plant dies. Just after infection, the interior of canes is reddened; but it turns brown later. Infected stems shrivel and turn brown to black. Small black spore-bodies develop just below the epidermal layer. Under certain favorable conditions, a curved thread-like mass of spores is borne from each spore-bearing body. Only cuttings from healthy plants should be used. Proper culture should be given. All diseased stems ought to be exterminated. In severe cases of infection crop rotation is necessary.

Smut. *Ustilago sacchari* Raben.—In many cane fields, heavy losses are produced by this disease. It is characterized by the blackened infected tips of young shoots, which are curved, slender, and whip-like. The organism extends downward into the shoot, inside the mass of leaf sheaths. Diseased plants ought to be cut down and burned. If the disease is present on wild sugar cane, these plants should be destroyed. Cuttings for new plantings should be taken only from healthy canes.

Yellow Stripe. Physiological disease.—The disease is characterized by yellowing of the leaves in stripes. No fungi were associated with the trouble; it apparently is of a physiological nature.

SUNFLOWER. *Helianthus annuus* Linn.

Leaf Spot. *Cercospora.*—Irregularly circular, black spots are present on leaves. The attack causes no harm.

SWEET PEA. *Pisum.*

Leaf Spot. *Phoma.*—Grayish circular spots with minute black specks may be found on sweet peas.

Powdery Mildew. Erysiphaceae.—Frequently, leaves, stems and pods are seriously infected with the powdery white growth of one of the Erysiphaceae. No perfect spores were observed on the material collected. In severe cases of infection the entire plant may be killed. Dusting with sulphur or the use of any standard fungicide will cause the death of the fungus.

SWEET POTATO. *Ipomoea batatas* (Linn.) Poir.

Leaf Spot. *Cercospora batatae* Zimm.—Severe damage may be done by the fungus. Blackish spots are formed, extending through the entire leaves (Plate III, fig. 3). Many fields are seriously affected. It appears that this trouble, as yet, has not made its appearance in the Philippines, and great precaution should be exercised to prevent its introduction. Crop rotation ought to be practiced as a control.

TAMPOI. *Eugenia javanica* Lam. (*Eugenia jambos* Blanco).

Black Mold. Undetermined.—The leaves are covered with a superficial black mold of the *Meliola* type.

Leaf Spot. *Cercospora.*—Gray centered spots, bordered with brown, are often produced in abundance on leaves. Plants suffer only slightly.

TOBACCO. *Nicotiana tabacum* Linn.

Bacterial Wilt. *Bacillus solanacearum* Erw. Smith—The tobacco may suffer heavily from the organism giving rise to wilt. The first indication is a wilting, later, the plants turn yellowish and die. The bacteria usually gain entrance into the xylem tubes of the vascular bundles by way of the root system. The disease is characteristic of all solanaceous plants. Only healthy plants should be selected from the seed bed. All soil for the growth of seedling should be sterilized. Once the soil is infected heavily, a five-year system of crop rotation ought to be practiced. During this time, no solanaceous plants should be grown. The destruction of diseased plants will prevent the accumulation of bacteria in the soil.

Chlorosis.—A chlorotic condition, or yellowing of plants, is commonly caused by an over-supply of water or by some lack of minerals in the soil. The abnormality is not considered as serious.

Leaf Spot. *Cercospora nicotianae* Ell. et Ev.— The common *Cercospora* leaf spot is in evidence in almost all plantations. The lower leaves are often seriously affected. The spots are characterized by being irregularly circular with ashen gray centers bordered with brown. Badly diseased leaves should be collected and used for an inferior grade of tobacco. Where possible, open planting ought to be practiced. Crop rotation will aid in checking the disease.

Mosaic.—The true mosaic malady causes serious losses in tobacco plantings. It is characterized by a mottled appearance of the leaves. Pale yellowish-green thin spots are formed over affected leaves. Most generally, such leaves are wrinkled and curled, due to unequal growth. Severely affected plants are stunted, and badly diseased leaves are worthless. The infection apparently is communicated from plant to plant by contact or insects. Only healthy plants from the seed-bed should be selected for planting. Soil used for seed-beds ought to be sterilized. All diseased plants should be pulled up and burned, care being taken not to touch healthy plants during the process.

TOMATO. *Lycopersicum esculentum* Mill.

Bacterial Wilt. *Bacillus solanacearum* Erw. Smith—Affected plants first wilt and then die. Aside from the wilting they appear entirely healthy, having green leaves and a sound root system. The bacteria responsible for this trouble are present in the xylem tubes in such numbers that the passage of water is retarded. The same organism was found to attack and cause a wilt of egg-plant, tobacco, pepper, and other plants. A similar wilt was observed on the condol, "Che Kua," *Benincasa hispida* Cogn., but it cannot be stated definitely that the organism responsible was identical. The extermination of diseased plants and crop rotation will keep the attack down to a minimum.

Leaf Spot. *Alternaria solani* (E. et M.) Jones et Grout.—Upon the leaves of tomato may be formed angular, pale centered spots with dark borders. In many cases the affected parts are concentrically marked. The disease first appears as minute brown specks. In severe cases of infection, the leaves dry and shrivel. The causal organism is undoubtedly the same as found attacking potato. Thorough spraying with Bordeaux mixture will reduce losses.

UBI. *Dioscorea alata* Linn.

LEAF SPOT. *Cercospora ubi* Rac.—A leaf spotting fungus is prevalent in many fields. Black areas are formed over the leaves. Not much harm is accomplished. Crop rotation is effective as a control.

Whitish spots on weakened leaves were found to be due to a *Phyllosticta*. The trouble is not common enough to cause losses.

YAUTIA. *Xanthosoma sagittifolium* Schott.

LEAF BLIGHT. Undetermined.—Commonly, the margins of leaves are yellowed or browned. The diseased part may extend into the leaf in the form of blotches. Whether the disturbance is due to a lack of water or to fungi could not be ascertained.

POSSIBILITIES OF DISEASE INTRODUCTION

Because of the prevalence in southern China of most fungus diseases, the possibilities of introducing many new ones there appears to be relatively slight. There are, however, a few extremely important diseases that either are not present in southern China or, if there, are not generally widespread. The Philippine Islands fare somewhat better than China in regard to the number of dangerous pests, although as is noted in the foregoing pages the majority of the diseases found in that country are also in the Philippines. The Philippine Islands are concerned not only with the exclusion of the few remaining diseases that might be imported from China, but also with the keeping out of pests from other countries. A group of excellent inspection and quarantine laws is in force in the Philippine Islands. With adequate enforcement of these laws, and a thorough knowledge of the existing diseases that are likely to be introduced, it seems possible to exclude all dangerous fungi. The value of an inspection of diseases of plants found in neighboring countries, from which plants are imported, is obvious. And first-hand knowledge of the character and destructiveness of diseases of other countries is indespensable to proper inspection and thorough quarantine.

A number of destructive fungi found in the East were not observed in the agricultural regions of Kwang Tung and Kwang Si Provinces. Two such diseases are the downy mildew of corn and the rust of coffee. Both are extremely dangerous, and every precaution should be taken to prevent their entrance into regions where they are not already found. The down mildew of corn, produced by *Sclerospora maydis* (Rac.) Butl., causes serious destruction in the Philippine Islands. Even though corn is not grown extensively in southern China, being produced only as a garden crop, great losses would result from the attacks of *Sclerospora*. If coffee culture were ever attempted on a large scale, care should be taken to exclude the rust-producing organism. And similar precautionary measures apply to other dangerous pests that are not already in southern China.

The Philippine Islands are directly interested in the quarantine against all serious diseases that are present in other countries. It is of extreme importance to exclude from the Philippines the following diseases: citrus scab, red spot of sorghum, *Sclerospora* diseases of millets and sorghum found in China; *Physoderma* disease of corn found in the United States and in sections of the East; *Sclerospora* of sugar cane found in Formosa; smut, *Ustilago shiraiana* P. Henn., of bamboos found in Japan; rust, and other dangerous diseases of bamboos found in China

and Japan; and the Fiji disease of sugar cane found in the Fiji Islands. Great precaution should be exercised not only to quarantine against these fungi, but also to prevent the introduction of any new plant diseases. Importation of sugar cane, corn, and bamboo, except under strict supervision and quarantine, should be prohibited from all those regions in which the diseases cited are found.

Insect pests were not investigated thoroughly during the trip; but the few observations made, especially of those on citrus, gave some indication of their prevalence. Undoubtedly, new and dangerous scale and other insects that are not found in the Philippines are present in China. It is of great importance to exclude detrimental insects as well as fungi.

ILLUSTRATIONS

Plate I

Fig. 1. Severe lichen attack on orange (*Citrus sinensis* Osbeck).
2. Citrus canker on leaf of orange (*Citrus sinensis* Osbeck).
3. Citrus canker on stem of pumelo (*Citrus grandis* Osbeck).
4. Citrus canker on leaf of pummelo (*Citrus grandis* Osbeck).
5. Severe *Septobasidium albidum* Pat. attack on living twigs of sour red lemon (*Citrus limonia* Osbeck). The fungus is parasitic on coccids.
6. *Septobasidium* on twig of orange (*Citrus sinensis* Osbeck). The fungus is parasitic on coccids.

Plate II

Fig. 1. Leaves of parasitic epiphyte (*Loranthus parasiticus* (Linn.) Merr.).
2. Parasitic epiphyte (*Loranthus parasiticus* (Linn.) Merr.), above, on pummelo (*Citrus grandis* Osbeck), below. Note the root-like structures that penetrate the citrus.
3. Work of the leaf miner (*Phyllocnistis citrella* Stainton), on leaves of orange (*Citrus sinensis* Osbeck).
4. Citrus canker on leaf of orange (*Citrus sinensis* Osbeck).
5. *Aschersonia aleyrodis* Webb. on orange leaf (*Citrus sinensis* Osbeck). Parasitic on coccids.
6. Scab on leaves of tangerine (*Citrus nobilis* Lour.).

Plate III

Fig. 1. Fruit rot of pepper caused by *Vermicularia capsici* Syd.
2. Red leaf spot of sorghum caused by *Colletotrichum graminicolum* (Ces.) Wils.
3. Leaf spot of sweet potato caused by *Cercospora batatae* Zimm.
4. Rust of pear leaf caused by *Gymnosporangium japonicum* Syd.
5. Shot hole of peach leaves caused by *Cladosporium carpophilum* Thüm.

(The writer is indebted to the Philippine Bureau of Science for taking the photographs of his specimens.)

PLATE I. DISEASES OF CITRUS.

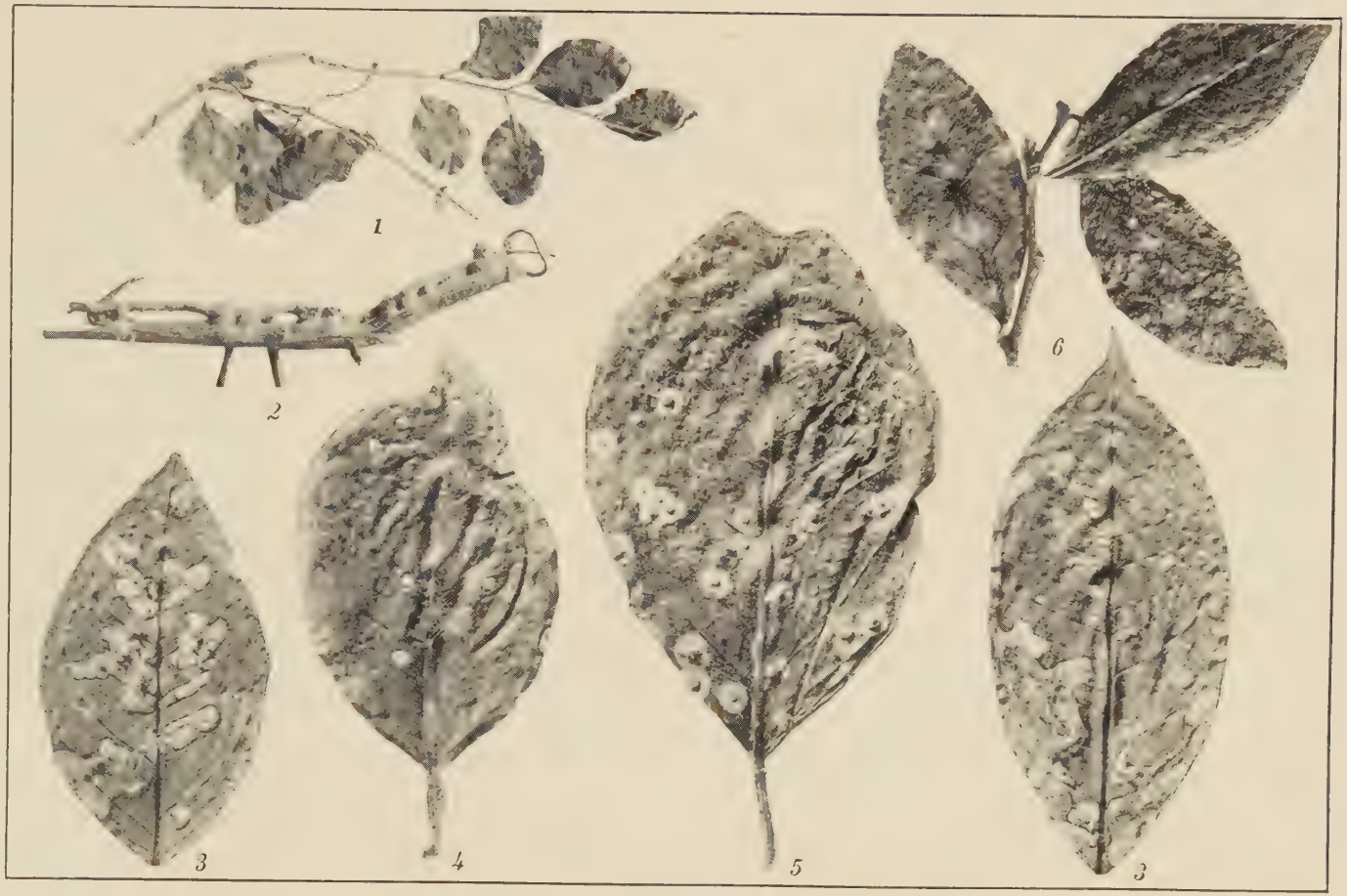

PLATE II. DISEASES OF CITRUS.

PLATE III. DISEASES OF SORGHUM, SWEET, POTATO, PEPPER, PEAR, AND PEACH.

COLLEGE AND ALUMNI NOTES

Professor Charles F. Baker, Dean of the College, is planning to make an inspection trip for the Department of Mindanao and Sulu. He expects to leave early in 1920, and may be away for several months.

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Quotation from a letter (Dec. 22, 1919) from Dean Baker to President Villamor:

In closing the year 1919 there are a number of things which might be passed in review as showing bettered conditions in the College of Agriculture and greater interest of the general public in the College.—I have the honor to invite your attention to a series of occurrences that illustrate this. This College has become a point of great interest to the teachers and students of many other schools in these Islands. Scarcely a week has passed by in the past few months without visits from parties of teachers and students from elsewhere. All of these visitors have greatly enjoyed the days spent here and have gone home active boosters for the College. The great importance of this to the University will be very apparent. In addition to this, it will also be apparent that this has furnished for the isolated Student Body of the College of Agriculture very extensive opportunities for social enjoyment that they had previously lacked. It is greatly to be hoped that the coming year will see still further developments of this important feature in the life of the College and its students. A list of some of the larger parties of visitors follows herewith:

1.	National Academy	150 students
2.	Nurses from the Philippine General Hospital	60 persons
3.	Manila High School	250 "
4.	Laguna High School	50 "
5.	Normal School	250 "
6.	Far Eastern College	60 "
7.	Mabini Intermediate	30 "
8.	Sampaloc Intermediate	120 "
9.	School of Pharmacy	100 "
10.	Manila Teachers (Bonifacio, Guipit, Quiapo)	80 "
11.	City Y. M. C. A. Institute	60 "
12.	Harris' Memorial Bible Training	20 "
13.	St. Mary's Hall	12 "
14.	Nurses from the Philippine General Hospital	10 "
15.	Batangas High School	40 "

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Professor Otto A. Reinking, Associate Professor of Plant Pathology, spent the months of May and June collecting diseased plants in southern China and Formosa. The trip was made possible through the co-operation of the Division of Crop Physiology and Breeding Investigations of the U. S. Department of Agriculture, and the University of the Philippines.

Professor Reinking left Manila on May 1, and on May 4 reached Canton, where he made his headquarters at the Canton Christian College with Mr. W. Groff. The first two weeks were spent in making collections in citrus and litchi (lychee) orchards and market gardens around Canton. On May 16 a special trip was made into the citrus districts around Paak Shan, south of Canton in the delta region. This is one of the best citrus sections in Kwang Tung Province. On May 23 Professor Reinking started on a trip to Sun Wui and Heung Shan districts and then across the

mountains to Macao. This is the famous delta region of Kwang Tung Province in southern China Citrus, plum, litchi (lychee), and peach orchards, and market gardens were visited. Extensive plantations of mulberries were seen around Sui Laam, which is noted for its silk industry. This trip was made overland and on foot. Native chow was eaten on all these trips. Professor Reinking returned to Canton by boat and started a trip along the West River into Kwang Si Province. He visited the pummelo district near Tang Uen, where a large pummelo called "Sha Tin Yau" is produced. On the return trip he stopped at Teng Oo monastery, which is one of the largest of the Buddha monasteries in southern China. The monastery is situated in a wooded spot that is excellent for making plant collections. On June 14 Professor Reinking visited the South China Agricultural Experiment Station, where he met the director and other scientists on the staff. On June 20 he left Canton for Hongkong, where he took a boat for Formosa, reaching Keelung on June 24. He then went to the Agricultural Experiment Station at Taipeh, the capital of Formosa; very good work is being done there in plant pathology. He made collections of scab and other diseases of citrus, and then went by train the entire length of the island down to Tainan, from where he proceeded to Daimokku, where the Government Sugar Experiment Station is located. There he met the staff, and made a special study of sugar cane and corn diseases. He then returned to Hongkong and sailed for Manila, reaching the College on July 7.

The semi-annual meeting of the Philippine Society of Technical Agriculturists was held on October 16, 1919, on the College Campus in the lecture room of the Agronomy Department. Professor Elayda, acting as chairman, made some introductory remarks on the agricultural development of the Philippines. The principal speaker of the meeting was Mr. Sanvictores, Assistant Director of the Bureau of Agriculture and President of the Society. He spoke on the "Agricultural development of Japan". Luncheon was served in the seed-house laboratory. Speeches were delivered, Dr. Espino acting as toastmaster. The talks were humorous and interesting. Professor Baker, Dean of the College, was the first speaker. Dr. Roxas spoke on "Making a 'central' out of tin cans". He was followed by Mr. Burgos, of the animal husbandry division of the Bureau of Agriculture, who related his experiences in importing chickens. Mr. Lavadia talked on "Knocking and boosting". Mr. Hidrosollo expressed his appreciation of the College, and praised the work of Dean Baker. After the speeches, the Board of Directors met, and a business meeting followed. Mr. Camus was elected temporary treasurer and Mr. Vibar temporary secretary. The following are newly admitted members: José G. Guevarra, D. R. Tuason, Esteban Collado, Juan Cabanos, Raymundo Sabado, Juan Torres, Jose Esguerra, Valentin Erese, Emiliano Roldan, Deogracias Villadolid, Tranquilino Ventura, Rafael B. Espino, Exequiel Alcasid, Pedro Layosa, Oscar Soriano, Benedicto C. Leaño, F. B. Serrano, Francisco Lago, Antonio R. Chanco, Pedro A. David, Victor Sulit, Ramon K. Habaluyas, and Fernando de Peralta.

On November 25, 1919, Dr. U. Yamamura, a wealthy land-owner of Mindanao, came to the College to have a conference with Dean Baker and Prof. Elayda regarding agricultural projects in his region, and to get information on the cultivation of rice and coconut. He subscribed to the *Philippine Agriculturist* and secured all the available publications on rice.

The students, members of the faculty, and friends of the Far Eastern College spent their Thanksgiving Day on the College Campus.

On December 13, 1919, the entire student body of the Sampaloc Intermediate School, together with their teachers and many friends, made an excursion to the College. The day was spent inspecting the laboratories and College

Farm. The visitors had a picnic lunch under the shade of ilang-ilang trees on the banks of the Molawin Creek. In the afternoon, the students of the College of Agriculture served them a bountiful "merienda" of camote, suman, and fruits.

The Veterinary Alumni Association held its semi-annual meeting at the College of Veterinary Science on November 8, 1919. The first speaker was Acting-Dean Baker. Regent Gonzalez spoke on the relation of veterinary science to agriculture, emphasizing its importance to animal husbandry. He also explained the motives that led him to labor to have the College of Veterinary Science transferred to Los Baños. Dr. Gomez, the Registrar of the College and Assistant Professor in Anatomy, acted as Chairman. After the speeches, the regular business meeting of the Association was held. Election of officers took place at this meeting. The meeting was followed by a luncheon at the College Mess Hall.

Mr. Atanacio Carandang, a senior student, was married to Miss Torres, sister of Juan Torres, assistant in Economics.

Valentin Erese, temporarily appointed assistant in Chemistry for the Experiment Station, resigned on December 1, 1919.

On December 6, 1919, the Juniors gave a dance, to which the Seniors were invited. Nurses of the Philippine General Hospital and young women from St. Mary's Hall attended. They were chaperoned by Miss Giron, the superintendent, and Miss Francisco. The dance lasted from eight until one o'clock. The girls spent the night at the homes of ladies of the faculty.

On December 7, the students, faculty members of the School of Pharmacy of the University of the Philippines, and their friends, numbering about one hundred, visited the College. They examined the different laboratories and Farm, and, late in the afternoon, had a dance in the Auditorium, the Calamba orchestra furnishing the music.

Pedro A David, '19, met with an accident November 15, when two fingers of his right hand were crushed by the cogs of the corn grinder, while he was cleaning the machine. He was taken to the Military Hospital of Los Baños for an operation, and afterwards to the General Hospital for subsequent treatment.

On November 14, the Juniors of the Laguna High School came to the College and spent the day sight-seeing and visiting their friends. The visitors had lunch in one of the student houses in the Coconut Grove.

Eligio Cruz, a former clerk of the College, returned, on October 1, to work in the Dean's office.

Mrs. Charlotte R. Gillis, Assistant Professor in English, reported for duty November 3, after spending several months on vacation in the United States.

Mrs. Grace L. Zschokke, who was appointed temporarily as instructor in English during the absence of Mrs. Charlotte R. Gillis, resigned on November 1, 1919.

The Chinese Educational Delegation from Central China visited the College on November 3. The Delegation made a tour of the Philippine Islands, studying the educational system, particularly of agricultural education, with the idea of adapting it for China. The Delegation was headed by the Commissioner of Schools for the province of Kiangsu, accompanied by several other educators, the principal of one of the secondary farm schools, and two superintendents of farm schools.

Marcelo Crisostomo, '13, in charge of the Iloilo Experiment Station, came to the College to visit old friends and to confer with Dean Baker concerning the work of his station.

On November 6, in the College Auditorium, Professor Baker gave an address on the traditions of the College, the meaning of practical patriotism, and what science stands for. The address was interesting and instructive.

The Study Body met on November 10, for the purpose of electing new officers. The following were elected:

1. *President*.....Antonio Derecho
2. *Vice-president*.....Julio Jamias
3. *Secretary*.....Andres Denoso
4. *Treasurer*.....Gerardo Ocfemia
5. *Athletic Representative*.....Eduardo Quisumbing
6. *Track Manager*.....Basilio Viado
7. *Baseball Manager*.....Alejandro Bucoy

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COLLEGE CO-OPERATIVE CO., INC.

WEATHER OBSERVATIONS, AUGUST, 1919.

Observer—R. P. Estioko

At College

Date	Rainfall.		Temperature.				Wind.		Cloudiness
	Daily.	Weekly.	Maximum.	Minimum.	Mean.		Daily.	Weekly.	
					Daily.	Weekly.			
August	*mm.*	*mm.*	*°C.*	*°C.*	*°C.*	*°C.*	*miles.*	*miles.*	
1	8.3		28.5	24.6	26.5		131.5		¾ cloudy
2	2.3	10.6	29.5	24.6	27.0	26.7	120.2	251.7	cloudy
3	4.7		27.5	24.6	26.0		26.1		cloudy
4	T		28.5	24.6	26.5		19.9		cloudy
5	4.5		26.5	23.6	25.0		34.7		cloudy
6	62.5		28.2	22.6	25.4		110.8		cloudy
7	69.3		27.0	24.6	25.8		198.4		cloudy
8	49.2		28.0	24.1	26.0		205.8		cloudy
9	42.6	249.8	27.0	25.1	25.9	25.8	201.1	796.8	cloudy
10	75.8		27.0	24.8	25.9		157.0		cloudy
11	35.8		27.0	25.6	26.3		229.9		cloudy
12	155.6		26.0	24.6	25.3		193.1		cloudy
13	154.8		27.5	24.6	26.0		108.5		cloudy
14	20.3		27.0	24.6	25.8		126.4		cloudy
15	3.5			24.6			18.1		cloudy
16	8.9	454.7	29.0	23.1	26.0	25.8	180.2	1013.2	cloudy
17	0.9		29.5	23.6	26.5		25.1		¾ cloudy
18	T		29.5	22.6	26.0		16.2		¾ cloudy
19	13.5		28.0	23.1	25.5		20.2		cloudy
20	18.1		25.5	23.6	24.5		170.8		cloudy
21	8.7		28.0	24.1	26.0		141.7		cloudy
22	T		31.0	22.6	26.8		23.4		½ cloudy
23	0	41.2	29.5	22.6	26.0	25.9	29.3	426.7	¾ cloudy
24	8.6		28.5	24.1	26.3		61.6		cloudy
25	79.5		27.0	22.6	24.8		93.2		cloudy
26	100.2		25.5	21.6	23.5		60.6		cloudy
27	11.8		26.5	21.6	24.0		26.7		cloudy
28	4.2		29.0	22.6	25.8		18.4		cloudy
29	0		28.0	22.1	25.0		27.9		cloudy
30	34.6	238.9	27.0	23.6	25.3	25.0	100.5	388.9	cloudy
31	6.8		25.5	23.6	24.5		110.7		cloudy
Monthly		1002.0				25.7		2988.0	

On Mount Makiling

Station on Mt. Makiling	Dates.	Rainfall.	Temperature.		
			Maximum.	Minimum.	Mean.
		mm.	*°C.*	*°C.*	*°C.*
Coffee plantation.....	Aug. 4 to Aug. 10	456.7	25.0	20.5	22.7
	Aug. 11 to Aug. 17	567.3	26.0	20.0	23.0
	Aug. 18 to Aug. 24	60.8	27.0	20.8	23.9
	Aug. 25 to Aug. 31	296.5	28.0	19.5	23.7
450 m. elevation on Mt. Makiling.	Aug. 4 to Aug. 10	403.8			
	Aug. 11 to Aug. 17	581.2			
	Aug. 18 to Aug. 24	63.7			
	Aug. 25 to Aug. 31	300.6			
Summit of Mt. Makiling..	Aug. 4 to Aug. 10	285.5			
	Aug. 11 to Aug. 17	542.1	20.7	18.6	19.7
	Aug. 18 to Aug. 24	48.6	20.3	18.9	19.6
	Aug. 25 to Aug. 31	255.6	19.6	18.1	18.9

The latter part of July and the entire month of August were cloudy, rainy and windy. The lack of sunshine checked the growth of all crops, and the excessive rain and wind also did considerable damage.

F. T. McLean,
Of the Dept. of Plant Physiology.

WEATHER OBSERVATIONS, SEPTEMBER, 1919.

Observer—R. P. Estioko

At College

Date.	Rainfall.		Temperature.				Wind.		Cloudiness.
	Daily.	Weekly.	Maximum.	Minimum.	Mean.		Daily.	Weekly.	
					Daily.	Weekly.			
	mm.	*mm.*	*°C.*	*°C.*	*°C.*	*°C.*	*miles.*	*miles.*	
August									
31.....	6.8		25.5	23.6	24.5		110.7		cloudy
September									
1.....	24.9		28.5	24.6	26.5		73.8		cloudy
2.....	T		29.5	23.6	26.5		29.6		cloudy
3.....	T		29.0	21.6	25.3		24.6		½ cloudy
4.....	O		31.5	22.1	26.8		24.7		½ cloudy
5.....	O		30.5	22.1	26.3		26.9		¾ cloudy
6.....	9.5	41.2	31.5	22.6	27.0	26.1	29.7	320.0	¾ cloudy
7.....	15.0		28.0	22.6	25.3		14.5		¾ cloudy
8.....	T		30.0	22.6	26.3		17.4		¾ cloudy
9.....	5.5		28.0	23.6	25.8		13.8		¾ cloudy
10.....	T		29.5	21.6	25.5		15.8		½ cloudy
11.....	5.4		27.0	23.6	25.3		11.6		cloudy
12.....	12.5		27.5	22.6	25.0		4.3		cloudy
13.....	0.5	38.9	29.0	23.1	26.0	25.6	17.6	95.0	¾ cloudy
14.....	0.5		29.0	22.6	25.8		18.7		¾ cloudy
15.....	70.3		29.0	22.1	25.5		14.6		¾ cloudy
16.....	22.2		28.0	23.6	25.8		14.6		cloudy
17.....	16.4		27.5	22.1	24.8		33.4		cloudy
18.....	20.4		27.0	22.6	24.8		27.6		¾ cloudy
19.....	O		28.5	23.6	26.0		38.3		½ cloudy
20.....	5.1	134.9	28.0	23.6	25.8	25.5	33.0	180.2	¾ cloudy
21.....	1.6		28.0	23.1	25.5		37.8		cloudy
22.....	O		29.0	23.6	26.3		58.7		½ cloudy
23.....	O		28.5	22.6	25.5		33.3		½ cloudy
24.....	O		29.5	22.6	26.0		54.5		½ cloudy
25.....	O		29.0	23.1	26.0		26.5		½ cloudy
26.....	O		29.0	23.6	26.3		39.0		½ cloudy
27.....	O	1.6	30.0	23.6	26.8	26.1	30.0	279.8	½ cloudy
28.....	1.5		28.0	22.6	25.3		15.0		¾ cloudy
29.....	T		30.0	22.6	26.3		20.4		½ cloudy
30.....	O	1.5	30.0	22.6	26.3		25.8	61.2	¼ cloudy
Monthly.....		211.3				25.9		825.5	

On Mount Makiling

Station on Mt. Makiling.	Dates.	Rainfall.	Temperature.		
			Maximum.	Minimum.	Mean.
		mm.	*°C.*	*°C.*	*°C.*
Coffee plantation.....	Sept. 1 to Sept. 7	52.8	31.5	19.5	25.5
	Sept. 8 to Sept. 14	27.2	29.0	20.0	24.5
	Sept. 15 to Sept. 21	102.4	30.0	19.0	24.5
	Sept. 22 to Sept. 28	0.5	30.0	20.0	25.0
	Sept. 29 to Oct. 5	2.3	32.5	20.0	26.2
450 m. elevation on Mt. Makiling.	Sept. 1 to Sept. 7	39.0			
	Sept. 8 to Sept. 14	23.5			
	Sept. 15 to Sept. 21	95.5			
	Sept. 22 to Sept. 28	0.6			
	Sept. 29 to Oct. 5	3.9			
Summit of Mt. Makiling..	Sept. 1 to Sept. 7	45.3	24.1	19.6	19.9
	Sept. 8 to Sept. 14	25.4	20.7	18.9	19.8
	Sept. 15 to Sept. 21	101.2	20.5	18.6	20.0
	Sept. 22 to Sept. 28	2.3	19.7	18.4	19.0
	Sept. 29 to Oct. 5	2.8	21.5	18.9	20.2

The month of September was less windy than average, otherwise it was quite typical, except for the last week of the month, which was dry.

F. T. McLean,
Of the Dept. of Plant Physiology.

UNIVERSITY OF THE PHILIPPINES

COLLEGE OF AGRICULTURE

LOS BAÑOS

The College of Agriculture is in its eleventh year, with a student body of 444. It occupies a tract of about three hundred and sixty hectares on which every important crop in the Philippines is under cultivation. It has a large series of varieties of leading crops and very numerous introduced plants under tests and observation. The number of distinct cultures, not including series of fertilizer experiments, is more than two thousand. The College has fourteen concrete buildings and several of mixed materials.

The courses are:

A six-year course (the first two years' work being preparatory only) based on graduation with good grades from the intermediate schools of the Philippine Islands and leading to the degree of Bachelor of Agriculture.

A four-year course based on the completion of the public high school course, and leading to the degree of Bachelor of Science in Agriculture.

Graduate work leading to the degree of Master of Science is given to persons holding the degree of Bachelor of Science.

Tuition for non-residents of the Philippines is ₱150.00 a year.

The College year began June 9, 1919.

For further information address the Dean of the College.